Abstract

Solid waste management has become one of the challenging problems worldwide due to rapidly increasing population, intensive agriculture and industrialization. Vermicomposting is being adopted worldwide as an innovative ecotechnology for conversion of various types of organic wastes into vermicompost. Not only this technology is cheap but it is more efficient in comparison to other conventional methods of waste recycling. It releases nutrients (locked in wastes) rapidly back to nature and converts them into plant available forms. Present work therefore envisaged bioremediation of the biosludges and effluents of three industries (Beverage, Distillery and Paper mill) situated in District Amritsar of Punjab, India with vermicomposting. These industries dump their solid wastes on land or in landfills and release their effluents in natural water bodies after preliminary treatment which causes heavy pollution of soil and water. Therefore, it was planned to improve quality of the solid and liquid wastes of these industries before their disposal in natural ecosystems. For bioremediation the solid wastes were fed to *Ei. fetida* in various combinations with cattle dung and the liquid wastes (effluents) of these industries were filtered through vermicompost biofilters. Co-composting with a complementary waste, the cattle dung helped to improve their acceptability for *Ei. fetida* and also improved physico-chemical characteristics of the products. It was observed that 50:50, 30:70 and 25:75 ratios respectively of beverage, paper and distillery industry sludge with cattle dung gave best growth and population buildup of *Ei. fetida*. Higher decline in organic carbon, higher content of nitrogen and phosphorous along with lower electrical conductivity and higher pH of the products of vermicomposting in comparison to the products of traditional aerobic composting indicated that *Ei. fetida* helped in fast conversion of these noxious sludges into a soil conditioner. Although there was an increase in the contents of transition metals in the products but these were within international limits for manures.

To determine the optimum weight of earthworms/kg waste for its conversion into a quality product in a shortest possible time the two best proportions of each sludge were inoculated with 0g, 7.5g, 12.5g and 25g worms/kg feed mixtures and rate of degradation and physico-chemical properties were evaluated. Rate of degradation
increased linearly with increase in weight of worms/kg feed mixture but physico-chemical characteristics were best in the products of the mixtures inoculated with 12.5g worms/kg mixture. In this phase transition metals (Cu, Fe, Mn, and Zn) declined over initial in all the products of vermicomposting and showed a positive correlation with the weight of worms/kg feed mixture. However, there was an increase in the contents of transition metals in the products of traditional aerobic composting.

This study further indicated that vermicompost served as an efficient biofilter and brought a decline in BOD, COD, TDS and TSS of the effluents and changed its pH to neutral. Therefore, by adopting this combined technology for management of their solid and liquid wastes industries will save money as well as our environment.